DOCKET NO.: THOM-0029
Application No.: 10/719,579
Office Action Dated: 3-17-2008

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Kenneth Edward Anthony Omersa

Application No.: **10/719,579**

Filing Date: **11-21-2003**

For: **Fuel Cell**

Confirmation No.: **3246**

Group Art Unit: **1795**

Examiner: **HODGE, ROBERT W.**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

DECLARATION OF MURRAY EDWARD BRUCE LEIGHTON PURSUANT TO 37 CFR § 1.132

I, Kenneth Edward Anthony Omersa, being duly warned that willful false statements and the like are punishable by fine or imprisonment or both, under 18 U.S.C. § 1001, and may jeopardize the validity of the patent application or any patent issuing thereon, state and declare as follows:

1. All statements herein made of my knowledge are true and statements made on information or belief are believed to be true.

2. I am the inventor of the subject matter of U.S. patent application no. 10/719,579 entitled "FUEL CELL". I am familiar with the disclosure, claims, and pending office action for application no. 10/719,579.

3. I am a director by Omnagen Limited. I have held this position since February 2002. I have a degree in Materials Science from Cambridge University, UK.

4. The claims which are currently being examined in Application no. 10/719,579 include two independent claims which are worded as follows:

> "1. A solid state fuel cell comprising a non-polymeric electrolyte, the fuel cell further comprising a member which supports one or more ceramic layers, the member having a porous region bounded by a non-porous region, the non-porous region creating a gas-tight seal which prevents direct combination of oxidant and fuel, and the member comprising metallic non-alloyed titanium."

> "65. A solid state fuel cell comprising a non-polymeric electrolyte, and further comprising a plurality of members, at least one of the plurality of members supporting one or more ceramic layers, each member having a porous region bounded by a non-porous region, the non-porous regions creating a gas-tight seal which prevents direct combination of oxidant and fuel; and the members comprising metallic non-alloyed titanium."

Each of claims 1 and 65 stands rejected by the examiner, in an Office Action dated March 17, 2008.

6. The examiner's principal ground for rejection is obviousness over the teaching of EP 1225648 (Shibata) in view of U.S. pre-grant publication no. 2002/0048699 (Steele). I believe however that independent claims 1 and 65 distinguish in a non-obvious way from the teachings of Shibata and Steele. This is explained by my attorney in a response that is to be filed with this declaration.

7. Furthermore, independent claims 1 and 65 require a titanium member having a porous region, and a non-porous bounding region which in the fuel cell creates a gas-tight seal preventing direct combination of oxidant and fuel. The member also is able to support one or more ceramic layers.

8. At temperature, titanium alloys and particularly non-alloyed titanium readily absorb small atoms (e.g. H, O, N, C) into their interstices. Hydrogen embrittlement is a real problem in fuel cells as either hydrogen or reformed hydrocarbons which produce hydrogen, are the main fuels. This, coupled with a parabolic increase in oxidation rate with temperature, means that pure titanium cannot in general be used continuously above 400 °C, and the most sophisticated alloy can typically only be used up to 500 °C. For these reasons, although metallic interconnects have long been used in solid oxide fuel cells, titanium interconnects were not considered.

9. I, however, realized that by using a metallic member as a support it would be possible, for example, to carry a thin ceramic electrolyte on the member, allowing the operating temperature of the fuel cell to be significantly reduced, and the drop in temperature in turn permitting titanium to be used much more widely than suggested by Shibata. In particular, I realized that the member, as well as supporting a ceramic layer, could take on a role of creating a gas-tight seal to prevent direct combination of oxidant and fuel. In contrast, in Shibata the thin adhering cathode layer is on the oxidant side only, is too thin to act as a support, and is entirely unsuitable for creating a gas-tight seal. There is nothing in Shibata, or in Steele for that matter, to suggest an expanded role for titanium in a fuel cell, as required by claims 1 and 65.

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10. In view of the response that is to be filed with this declaration and my comments above, I believe that claims 1 and 65 (and claims 1-3, 8, 10, 13, 14, 21, 23, 65, 66, 68, 71, 73, and 74 which ultimately depend from one of claims 1 and 65) are patentable.

Date: 15th July 2008

Kenneth Edward Anthony Omersa